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EXAMINER	
PERILLA, JASON M	

ART UNIT	PAPER NUMBER
2634	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/742,686	MITLIN ET AL.	
	Examiner	Art Unit	
	Jason M Perilla	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 December 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10,12-17,35 and 37-40* is/are allowed.

6)☒ Claim(s) *1-8,18-33 and 41-48* is/are rejected.

7)☒ Claim(s) *9,11,34 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 December 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2 - 6/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-48 are pending in the instant application.

Priority

2. Priority claim to U.S. Provisional patent application serial No. 60/239811 filed October 12, 2000 is acknowledged.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on June 15, 2001 (paper no. 2 in the file) was in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

4. New corrected drawings are required in this application because the drawings do not represent a formal copy. Particularly, figures 2, and 7A-C should be corrected because they are too dark, and the notations on the drawings are not discernable. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

5. Claims 8, 9, 11, 22, 23, 25, 28, 30, 33, 34, 36, 45, and 48 are objected to because of the following informalities:

Regarding claim 8, it is suggested by the examiner that the limitation of claim 8 comprising setting $b(y_{eff}, s, z)$ to $b(y_{eff}, 1, 0)$ should be more clearly stated as comprising setting s=1 and z=0.

Regarding claim 22, it is required by the examiner that the applicant corrects the dependency of the claim for correct antecedent basis of Θ. It is assumed that the applicant wishes claim 22 to depend upon claim 18.

Regarding claim 23, it is suggested by the examiner that the applicant reviews the dependency of claim 23. Claim 6, being analogous to claim 23, is dependent upon claim 1, and suggests that claim 23 was

Regarding claim 25, it is suggested by the examiner that the limitation of claim 25 comprising setting $b(y_{eff}, s, z)$ to $b(y_{eff}, 1, 0)$ should be more clearly stated as comprising setting s=1 and z=0.

Regarding claim 28, it is suggested by the examiner that the applicant reviews the dependency of claim 28. Currently, claim 28 is dependent upon claim 22 although it is expected to be dependent upon claim 26.

Regarding claim 30, it is required by the examiner that the applicant corrects the dependency of the claim for correct antecedent basis of Θ. It is assumed that the applicant wishes claim 30 to depend upon claim 29.

Regarding claim 33, it is suggested by the examiner that the limitation of claim 33 comprising setting $b(y_{eff}, s, z)$ to $b(y_{eff}, 1, 0)$ should be more clearly stated as comprising setting s=1 and z=0.

Regarding claim 45, it is required by the examiner that the applicant corrects the dependency of the claim for correct antecedent basis of Θ. It is assumed that the applicant wishes claim 45 to depend upon claim 44.

Regarding claim 48, it is suggested by the examiner that the limitation of claim 48 comprising setting $b(y_{eff}, s, z)$ to $b(y_{eff}, 1, 0)$ should be more clearly stated as comprising setting s=1 and z=0.

Appropriate correction is required.

6. Claim 9 recites the limitation "said representative performance measurement" in line 4. There is insufficient antecedent basis for this limitation in the claim.

7. Claim 11 recites the limitation "said representative performance measurement" in line 4. There is insufficient antecedent basis for this limitation in the claim.

8. Claim 34 recites the limitation "said representative performance measurement" in line 4. There is insufficient antecedent basis for this limitation in the claim.

9. Claim 36 recites the limitation "said representative performance measurement" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. Claims 1-8, 18-33, and 41-48 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one

skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding claim 1, one skilled in the art is not enabled to use the relationship provided in claim 1 to compute the maximum number of symbol errors that can be corrected t because the maximum number of symbol errors t is not included in the relationship. Further, the relationship, given by equation 16.1 on page 81, is described in the specification as "similar to the method described in section I with respect to FIG. 5 except that the FEC parameters include the number of DMT symbols per FEC frame s and the number of FEC control code symbols per DMT symbol z, rather than the maximum number of correctable errors t (page 84, lines 7-10)." Hence, the relationship does not involve the number of correctable errors t, and the claim is not enabled to one of ordinary skill in the art by the specification. Further, the examiner notes that the closest relationship in the specification defining W(s, z, K) is equation 16.3 found on page 82. However, the equation 16.3 of page 82 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 1 is not enabled by the specification.

Regarding claims 2-3, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 4, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not enabled by the specification because it is not present in the specification. The examiner notes that the closest relationship in the specification defining the difference between a bit error rate

prior to decoding and the target bit error rate Θ is found in equation 17.2 of page 87. However, the equation 17.2 of page 87 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 4 is not enabled by the specification.

Regarding claims 5-8, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 18, one skilled in the art is not enabled to use the relationship provided in claim 18 to compute the maximum number of symbol errors that can be corrected t because the maximum number of symbol errors t is not included in the relationship. Further, the relationship, given by equation 16.1 on page 81, is described in the specification as "similar to the method described in section I with respect to FIG. 5 except that the FEC parameters include the number of DMT symbols per FEC frame s and the number of FEC control code symbols per DMT symbol z, rather than the maximum number of correctable errors t (page 84, lines 7-10)." Hence, the relationship does not involve the number of correctable errors t, and the claim is not enabled to one of ordinary skill in the art by the specification.

Regarding claims 19-20, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 21, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not enabled by the specification because it is not present in the specification. The examiner notes that the closest relationship in the specification defining the difference between a bit error rate

prior to decoding and the target bit error rate Θ is found in equation 17.2 of page 87. However, the equation 17.2 of page 87 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 4 is not enabled by the specification.

Regarding claims 22-25, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 26, one skilled in the art is not enabled to use the relationship provided in claim 26 to compute the maximum number of symbol errors that can be corrected t because the maximum number of symbol errors t is not included in the relationship. Further, the relationship, given by equation 16.1 on page 81, is described in the specification as "similar to the method described in section I with respect to FIG. 5 except that the FEC parameters include the number of DMT symbols per FEC frame s and the number of FEC control code symbols per DMT symbol z, rather than the maximum number of correctable errors t (page 84, lines 7-10)." Hence, the relationship does not involve the number of correctable errors t, and the claim is not enabled to one of ordinary skill in the art by the specification. Further, the examiner notes that the closest relationship in the specification defining W(s, z, K) is equation 16.3 found on page 82. However, the equation 16.3 of page 82 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 26 is not enabled by the specification.

Regarding claims 27-28, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 29, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not enabled by the specification because it is not present in the specification. The examiner notes that the closest relationship in the specification defining the difference between a bit error rate prior to decoding and the target bit error rate Θ is found in equation 17.2 of page 87. However, the equation 17.2 of page 87 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 29 is not enabled by the specification.

Regarding claims 30-33, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 41, one skilled in the art is not enabled to use the relationship provided in claim 40 to compute the maximum number of symbol errors that can be corrected t because the maximum number of symbol errors t is not included in the relationship. Further, the relationship, given by equation 16.1 on page 81, is described in the specification as "similar to the method described in section I with respect to FIG. 5 except that the FEC parameters include the number of DMT symbols per FEC frame s and the number of FEC control code symbols per DMT symbol z, rather than the maximum number of correctable errors t (page 84, lines 7-10)." Hence, the relationship does not involve the number of correctable errors t, and the claim is not enabled to one of ordinary skill in the art by the specification.

Regarding claims 42-43, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 44, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not enabled by the specification because it is not present in the specification. The examiner notes that the closest relationship in the specification defining the difference between a bit error rate prior to decoding and the target bit error rate Θ is found in equation 17.2 of page 87. However, the equation 17.2 of page 87 includes the framing mode index ρ which is not included in the relationship of the claim. Therefore, claim 4 is not enabled by the specification.

Regarding claims 45-48, the claims are rejected as being dependent upon a rejected parent claim.

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claims 1-8, 18-33, and 41-48 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, the relationship in the claim is not fully defined so that one skilled in the art could utilize it. Claim 1 is indefinite because there are items or functions in the claim that have no definition. The following variables or constants in the relationship of claim 1 are not defined:

a. ε_s is not defined.

b. α is not defined.

c. The number of bit positions b is used as a function of 3 variables (i.e. $b(y_{eff}, s, z)$) although this function is not defined. If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), the relationship should be defined in the claim.

The applicant is reminded that when an equation is used to define a relationship in a claim, all terms in the equation should be defined in the claim itself. If an equation presented to limit a claim is not fully defined in the claim so that one of ordinary skill in the art is able to apply it readily, the claim becomes indefinite.

Regarding claim 2, claim 2 is rejected as being dependent upon a rejected parent claim.

Regarding claim 3, the value of N_{max} is not defined, and it renders the claim indefinite.

Regarding claim 4, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not fully defined because the definition of sn_{eff} is not provided in the claim, and the lacking definition renders the claim indefinite. Further, the claim is indefinite because the target bit error rate p_e is also defined as the channel symbol error rate p_e.

Regarding claim 5, claim 5 is rejected as being dependent upon a rejected parent claim.

Regarding claim 6, the function of the number of bit positions of a quadrature amplitude modulation symbol $b(y_{eff}, s, z)$ is set to $(\alpha N_{max}/sn_{eff})$, but it is unclear if the

number of bit positions b is a function (see regarding claim 1). If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), it is unclear if b should be set to ($\alpha N_{max}/sn_{eff}$) for all values of y_{eff}, s, and z. Hence, the claim is indefinite.

Regarding claims 7-8, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 18, the relationship in the claim is not fully defined so that one skilled in the art could utilize it. Claim 1 is indefinite because there are items or functions in the claim that have no definition. The following variables or constants in the relationship of claim 1 are not defined:

d. ε_s is not defined.

e. α is not defined.

f. The number of bit positions b is used as a function of 3 variables (i.e. $b(y_{eff}, s, z)$) although this function is not defined. If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), the relationship should be defined in the claim.

The applicant is reminded that when an equation is used to define a relationship in a claim, all terms in the equation should be defined in the claim itself. If an equation presented to limit a claim is not fully defined in the claim so that one of ordinary skill in the art is able to apply it readily, the claim becomes indefinite.

Regarding claim 19, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 20, the value of N_{max} is not defined, and it renders the claim indefinite.

Regarding claim 21, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not fully defined because the definition of sn_{eff} is not provided in the claim, and the lacking definition renders the claim indefinite. Further, the claim is indefinite because the target bit error rate p_e is also defined as the channel symbol error rate p_e.

Regarding claim 22, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 23, the function of the number of bit positions of a quadrature amplitude modulation symbol $b(y_{eff}, s, z)$ is set to $(\alpha N_{max}/sn_{eff})$, but it is unclear if the number of bit positions b is a function (see regarding claim 1). If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), it is unclear if b should be set to $(\alpha N_{max}/sn_{eff})$ for all values of y_{eff}, s, and z. Hence, the claim is indefinite.

Regarding claims 24-25, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 26, the relationship in the claim is not fully defined so that one skilled in the art could utilize it. Claim 26 is indefinite because there are items or

functions in the claim that have no definition. The following variables or constants in the relationship of claim 1 are not defined:

g. ε_s is not defined.

h. α is not defined.

i. The number of bit positions b is used as a function of 3 variables (i.e. $b(y_{eff}, s, z)$) although this function is not defined. If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), the relationship should be defined in the claim.

The applicant is reminded that when an equation is used to define a relationship in a claim, all terms in the equation should be defined in the claim itself. If an equation presented to limit a claim is not fully defined in the claim so that one of ordinary skill in the art is able to apply it readily, the claim becomes indefinite.

Regarding claim 27, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 28, the value of N_{max} is not defined, and it renders the claim indefinite.

Regarding claim 29, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not fully defined because the definition of sn_{eff} is not provided in the claim, and the lacking definition renders the claim indefinite. Further, the claim is indefinite because the target bit error rate p_e is also defined as the channel symbol error rate p_e.

Regarding claim 30, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 31, the function of the number of bit positions of a quadrature amplitude modulation symbol $b(y_{eff}, s, z)$ is set to $(\alpha N_{max}/sn_{eff})$, but it is unclear if the number of bit positions b is a function (see regarding claim 1). If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), it is unclear if b should be set to $(\alpha N_{max}/sn_{eff})$ for all values of y_{eff}, s, and z. Hence, the claim is indefinite.

Regarding claims 32-33, the claims are rejected as being dependent upon a rejected parent claim.

Regarding claim 41, the relationship in the claim is not fully defined so that one skilled in the art could utilize it. Claim 1 is indefinite because there are items or functions in the claim that have no definition. The following variables or constants in the relationship of claim 1 are not defined:

j. ε_s is not defined.

k. α is not defined.

l. The number of bit positions b is used as a function of 3 variables (i.e. $b(y_{eff}, s, z)$) although this function is not defined. If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), the relationship should be defined in the claim.

The applicant is reminded that when an equation is used to define a relationship in a claim, all terms in the equation should be defined in the claim itself. If an equation presented to limit a claim is not fully defined in the claim so that one of ordinary skill in the art is able to apply it readily, the claim becomes indefinite.

Regarding claim 42, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 43, the value of N_{max} is not defined, and it renders the claim indefinite.

Regarding claim 44, the relationship for determining the difference between a bit error rate prior to decoding and the target bit error rate Θ is not fully defined because the definition of sn_{eff} is not provided in the claim, and the lacking definition renders the claim indefinite. Further, the claim is indefinite because the target bit error rate p_e is also defined as the channel symbol error rate p_e.

Regarding claim 45, the claim is rejected as being dependent upon a rejected parent claim.

Regarding claim 46, the function of the number of bit positions of a quadrature amplitude modulation symbol $b(y_{eff}, s, z)$ is set to $(\alpha N_{max}/sn_{eff})$, but it is unclear if the number of bit positions b is a function (see regarding claim 1). If the number of bit positions b is a function of the effective signal to noise ratio (y_{eff}), the number of DMT signals per frame (s), and the number of code control symbols per DMT symbol (z), it is unclear if b should be set to $(\alpha N_{max}/sn_{eff})$ for all values of y_{eff}, s, and z. Hence, the claim is indefinite.

Regarding claims 47-48, the claims are rejected as being dependent upon a rejected parent claim.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

14. Claims 1, 3, 18, 20, 26, 28, 41, and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Chow et al (5479447 – IDS ref. AE).

Regarding claim 1, Chow et al discloses a method of determining an optimum bit load per sub-channel in a multi-carrier system with forward error correction (fig. 1; col. 6, lines 61-67), comprising: computing one or more values of a maximum number of symbol errors that can be corrected t by the signal to noise ratio (SNR) gap (col. 3, lines 50-67; col. 7, lines 45-50), and a number of symbols in the information field K (col. 7, lines 57-67) to determine the optimum bit load per sub-channel. With regard to the relationships presented, even if they were enabled by the specification (see 112 1st

paragraph rejections above), the relationships included in claim 1 of equations 16.1 thru 16.3 of the specification are inherent to the transmission system of the applicant as well as the prior art reference Chow et al. Equations 16.1 thru 16.3 are comprised of the inherent relationships between the bit size of a DMT symbol in a DMT system with FEC at the BER of ε. Hence, the relationship provides no limitation to the claim. The examiner notes that the laws of nature, physical phenomena and abstract ideas are not patentable subject matter. The examiner points out that *all* of the relationships provided for the derivation of equations 16.1-16.3 are drawn from inherent properties of the system and are not provided by novel or inventive steps. Chow et al does disclose selecting the maximum number of symbol errors that can be corrected t which is calculated by the coding gain included in the SNR gap (col. 3, lines 51-67), and the number of symbols in the information field K such that the uncoded bit error rate p.sub.b that produces a symbol error rate that is less than or equal to the target symbol error rate or desired bit error rate (col. 7, line 47) is increased (col. 7, line 40 – col. 8, line 55).

Regarding claim 3, Levin discloses the limitations according to claim 1 as applied above. Further, the size of the frame ranging from 0 to N_{max}-s-zs symbols is arbitrary in view of the specification, and it is considered a matter of design choice. The specification does not suggest that the use of between 0 to N_{max}-s-zs symbols is a novel limitation of the invention, and such a frame size is applicable in the prior art references as well. Therefore, the frame size is considered a matter of design choice.

Regarding claim 18, Chow et al discloses a method of determining an optimum bit load per sub-channel in a multi-carrier system with forward error correction (fig. 1;

col. 6, lines 61-67), comprising: computing one or more values of a maximum number of symbol errors that can be corrected t by the signal to noise ratio (SNR) gap (col. 3, lines 50-67; col. 7, lines 45-50), and a number of symbols in the information field K (col. 7, lines 57-67) to determine the optimum bit load per sub-channel. With regard to the relationships presented, even if they were enabled by the specification (see 112 1st paragraph rejections above), the relationships included in claim 1 of equations 16.1 thru 16.3 of the specification are inherent to the transmission system of the applicant as well as the prior art reference Chow et al. Equations 16.1 thru 16.3 are comprised of the inherent relationships between the bit size of a DMT symbol in a DMT system with FEC at the BER of ε. Hence, the relationship provides no limitation to the claim. The examiner notes that the laws of nature, physical phenomena and abstract ideas are not patentable subject matter. The examiner points out that *all* of the relationships provided for the derivation of equations 16.1-16.3 are drawn from inherent properties of the system and are not provided by novel or inventive steps. Chow et al does disclose selecting the maximum number of symbol errors that can be corrected t which is calculated by the coding gain included in the SNR gap (col. 3, lines 51-67), and the number of symbols in the information field K such that the uncoded bit error rate p.sub.b that produces a symbol error rate that is less than or equal to the target symbol error rate or desired bit error rate (col. 7, line 47) is increased (col. 7, line 40 – col. 8, line 55).

Regarding claim 20, Levin discloses the limitations according to claim 18 as applied above. Further, the size of the frame ranging from 0 to N_{max}-s-zs symbols is arbitrary in view of the specification, and it is considered a matter of design choice. The

specification does not suggest that the use of between 0 to N_{max}-s-zs symbols is a novel limitation of the invention, and such a frame size is applicable in the prior art references as well. Therefore, the frame size is considered a matter of design choice.

Regarding claim 26, Chow et al discloses An apparatus for determining an optimum bit load per sub-channel in a multi-carrier system with forward error correction (fig. 1; col. 6, lines 61-67), comprising: computing one or more values of a maximum number of symbol errors that can be corrected t by the signal to noise ratio (SNR) gap (col. 3, lines 50-67; col. 7, lines 45-50), and a number of symbols in the information field K (col. 7, lines 57-67) to determine the optimum bit load per sub-channel. With regard to the relationships presented, even if they were enabled by the specification (see 112 1st paragraph rejections above), the relationships included in claim 1 of equations 16.1 thru 16.3 of the specification are inherent to the transmission system of the applicant as well as the prior art reference Chow et al. Equations 16.1 thru 16.3 are comprised of the inherent relationships between the bit size of a DMT symbol in a DMT system with FEC at the BER of ε. Hence, the relationship provides no limitation to the claim. The examiner notes that the laws of nature, physical phenomena and abstract ideas are not patentable subject matter. The examiner points out that *all* of the relationships provided for the derivation of equations 16.1-16.3 are drawn from inherent properties of the system and are not provided by novel or inventive steps. Chow et al does disclose selecting the maximum number of symbol errors that can be corrected t which is calculated by the coding gain included in the SNR gap (col. 3, lines 51-67), and the number of symbols in the information field K such that the uncoded bit error rate p.sub.b

that produces a symbol error rate that is less than or equal to the target symbol error rate or desired bit error rate (col. 7, line 47) is increased (col. 7, line 40 – col. 8, line 55).

Regarding claim 28, Levin discloses the limitations according to claim 26 as applied above. Further, the size of the frame ranging from 0 to N_{max}-s-zs symbols is arbitrary in view of the specification, and it is considered a matter of design choice. The specification does not suggest that the use of between 0 to N_{max}-s-zs symbols is a novel limitation of the invention, and such a frame size is applicable in the prior art references as well. Therefore, the frame size is considered a matter of design choice.

Regarding claim 41, Chow et al discloses an apparatus for determining an optimum bit load per sub-channel in a multi-carrier system with forward error correction (fig. 1; col. 6, lines 61-67), comprising: computing one or more values of a maximum number of symbol errors that can be corrected t by the signal to noise ratio (SNR) gap (col. 3, lines 50-67; col. 7, lines 45-50), and a number of symbols in the information field K (col. 7, lines 57-67) to determine the optimum bit load per sub-channel. With regard to the relationships presented, even if they were enabled by the specification (see 112 1st paragraph rejections above), the relationships included in claim 1 of equations 16.1 thru 16.3 of the specification are inherent to the transmission system of the applicant as well as the prior art reference Chow et al. Equations 16.1 thru 16.3 are comprised of the inherent relationships between the bit size of a DMT symbol in a DMT system with FEC at the BER of ε. Hence, the relationship provides no limitation to the claim. The examiner notes that the laws of nature, physical phenomena and abstract ideas are not patentable subject matter. The examiner points out that *all* of the relationships provided

for the derivation of equations 16.1-16.3 are drawn from inherent properties of the system and are not provided by novel or inventive steps. Chow et al does disclose selecting the maximum number of symbol errors that can be corrected t which is calculated by the coding gain included in the SNR gap (col. 3, lines 51-67), and the number of symbols in the information field K such that the uncoded bit error rate p.sub.b that produces a symbol error rate that is less than or equal to the target symbol error rate or desired bit error rate (col. 7, line 47) is increased (col. 7, line 40 – col. 8, line 55).

Regarding claim 43, Levin discloses the limitations according to claim 41 as applied above. Further, the size of the frame ranging from 0 to N_{max}-s-zs symbols is arbitrary in view of the specification, and it is considered a matter of design choice. The specification does not suggest that the use of between 0 to N_{max}-s-zs symbols is a novel limitation of the invention, and such a frame size is applicable in the prior art references as well. Therefore, the frame size is considered a matter of design choice.

15. Claims 1-3, 18-20, 26-28, and 41-43 are rejected under 35 U.S.C. 102(e) as being anticipated by Levin (6130882).

Regarding claim 1, Levin discloses a method of determining an optimum bit load per sub-channel in a multi-carrier system (col. 1, lines 37-56) with forward error correction (abstract; col. 1, lines 20-56). Levin discloses a variable bit load multi-carrier discrete multi-tone (DMT) communications system wherein the bit rate is adapted according to the signal to noise ratio (figs. 1-4). As one skilled in the art understands, forward error correction (FEC) can be utilized in a communication system to overcome noisy channels and bit transmission errors. However, FEC adds redundant bits to the

transmission of data so that the receiver is able to correct errors in the transmission, and the redundant bits consume bandwidth. Therefore, the system designer of a communications system using FEC must balance the need for encoding the data of the transmission according to the amount of perceived signal error at the side of the receiver with the least amount of redundant bits used for FEC encoding to increase the actual data throughput. Hence, the "optimum bit load" and forward error correction encoding parameters are related. The invention of Levin is an adaptive FEC encoding technique which balances bit errors in a noisy channel with the optimum bit rate possible for the channel. Levin does disclose computing one or more values of a maximum number of symbol errors that can be corrected t by the calculation of the coding gain (col. 5, lines 45-56). Levin discloses that coding gain represents the increase in performance when block coding or convolutional coding is implemented, and that the data rate is calculated based on the desired performance margin, the number of carriers used in the system, the signal-to-noise ratio for the system (col. 6, lines 5-12). Lastly, Levin discloses that the bit rate can be adjusted by the amount of error coding used (col. 6, line 13). Further regarding claim 1, Levin discloses determining the number of symbols in the information field K to determine the optimum bit load per sub-channel (col. 4, line 51 – col. 5, line18). With regard to the relationships presented, even if they were enabled by the specification (see 112 1st paragraph rejections above), the relationships included in claim 1 of equations 16.1 thru 16.3 of the specification are inherent to the transmission system of the applicant as well as the prior art reference Levin. Equations 16.1 thru 16.3 are comprised of the inherent relationships between

the bit size of a DMT symbol in a DMT system with FEC at the BER of ε. Hence, the relationship provides no limitation to the claim. The examiner notes that the laws of nature, physical phenomena and abstract ideas are not patentable subject matter. The examiner points out that *all* of the relationships provided for the derivation of equations 16.1-16.3 are drawn from inherent properties of the system and are not provided by novel or inventive steps.

Regarding claim 2, Levin discloses the limitations according to claim 1 as applied above. Further, Levin discloses the signal to noise ratio is a single number for the plurality of channels per bits in figure 3. Therefore, it is obvious that the signal to noise ratio as disclosed by Levin is actually an average of at least a subset of the channels in the system because the signal to noise ratio is not described for each channel individually.

Regarding claim 3, Levin discloses the limitations according to claim 1 as applied above. Further, the size of the frame ranging from 0 to N_{max}-s-zs symbols is arbitrary in view of the specification, and it is considered a matter of design choice. The specification does not suggest that the use of between 0 to N_{max}-s-zs symbols is a novel limitation of the invention, and such a frame size is applicable in the prior art references as well. Therefore, the frame size is considered a matter of design choice.

Allowable Subject Matter

16. Claims 4-8, 21-25, 29-33, and 44-48 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

17. Indication of allowable subject matter is made with regard to claims 9-10, 11-14, 15-17, 34-35, 36-39, and 40.

18. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 9-10 and 34-35, indication of allowable subject matter is made because the prior art of record does not disclose storing the number of discrete DMT symbols, or the number of FEC control symbols in a table for the selection of FEC parameters.

Regarding claims 11-14 and 36-39, indication of allowable subject matter is made because the prior art of record does not disclose storing the number of discrete DMT symbols, or the number of FEC control symbols in a table for the selection of FEC parameters.

Regarding claims 15-17 and 40, indication of allowable subject matter is made because the prior art of record does not disclose the selection of t, K, and k such that no forward error correction is applied when the number of sub-channels exceeds a predetermined threshold number of sub-channels.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following prior art of record not relied upon above is cited to further show the state of the art with respect to the determination of a maximum bit load per sub-channel in a multi-carrier communications system using forward error correction.

U.S. Pat. No. 6163766 to Kleider et al.

U.S. Pat. No. 6128763 to LoGalbo et al.

U.S. Pat. No. 5896391 to Solheim et al.

U.S. Pat. No. 6092230 to Wood et al.

U.S. Pat. No. 6088390 to Russell et al.

U.S. Pat. No. 6101233 to Betts.

U.S. Pat. No. 5699365 to Klayman et al.

U.S. Pat. No. 5600663 to Ayanoglu et al.

U.S. Pat. No. 5511079 to Dillon.

U.S. Pat. No. 5699369 to Guha.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M Perilla whose telephone number is (703) 305-0374. The examiner can normally be reached on M-F 8-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Chin can be reached on (703) 305-4714. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason M Perilla
March 6, 2004

jmp

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